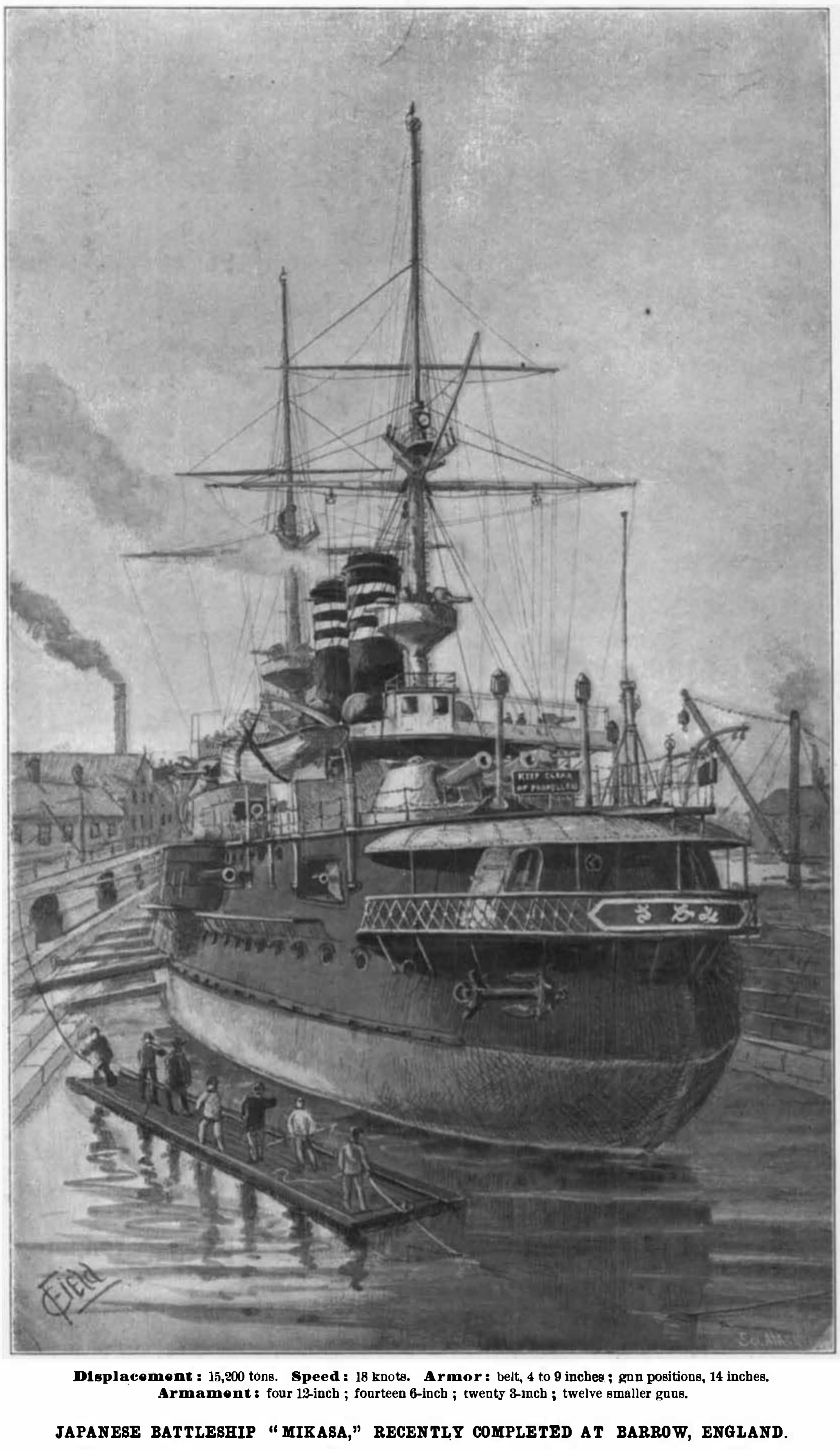
THE NEW JAPANESE BATTLESHIP "MIKASA."

We present an illustration of the new Japanese battleship "Mikasa," the largest and, as many believe, the most perfect battleship in existence. The drawing represents the vessel in the naval dockyard at Portsmouth, where she was placed to have her bottom cleaned, preparatory to her official trial in Stokes Bay. The new warship is a mighty affair, bigger even than the "Good Hope," or the battleships "London" or "Vengeance," which, by the way, she rather closely resembles, although she is unquestionably a better protected and more powerful ship than they. Like all the new battleships of the Japanese navy, she was built in an English yard, having recently been turned out by the shipbuilding firm at Barrow. A sister ship, the "Asahi," was built at Clydebank; the "Shikishima," a battleship of about 14,850 tons displacement, was built on the Thames; the "Hatsuse," of 15,000 tons, at Elswick; and the "Fuji" and "Yashima," each of 12,320 tons, were built respectively on the Thames and by the Elswick firm. All of these fine ships are of 18 knots speed or over; the "Fuji," "Yashima" and the "Hatsuse" having made over 19 knots on trial. The displacement of the "Mikasa" is 15,200 tons.

One of the best features of this big vessel is the very complete way in which she is armored, particularly in respect to the protection afforded to the secondary battery. Unlike the vessels of the English navy and the English-built Japanese battleships "Fuji" and "Yashima," the "Mikasa" has her secondary battery protected by a continuous wall of side armor, a system of protection which we have always favored in our own navy. This affords a completely inclosed battery, and there is no danger of shells entering the battery through the unprotected stretches of the sides of the ship lying between armored casemates. The belt armor at the waterline is from 4 to 9 inches thick. Above that her lower deck is cuirassed by 9-inch plating with 14-inch fore-and-aft bulkheads. Her casemated battery is covered with 6-inch armor, her barbettes with 14 inches below and 8 inches over the guns, while she has in addition an armored deck which on the slopes is no less than 4 inches in thickness. So the "Mikasa" may well be said to be clad in "cap-à-pied" armor.

Her armament is not less imposing, consisting as it does of four long 12-inch guns, fourteen 6-inch and twenty 3-inch quick-firing cannon, twelve light rapid-fire guns and four submerged torpedo tubes. Nor must the formidable ram be forgotten, which is strengthened and stiffened—as is the case in the later English battleships—by the side armor being brought down so as to cover it entirely for some way back. In short, there will be no bigger or more powerful fighting ship in far eastern waters than the "Mikasa" when she arrives at her destination.



Displacement: 15,200 tons. **Speed:** 18 knots. **Armor:** belt, 4 to 9 inches; gun positions, 14 inches.
Armament: four 12-inch; fourteen 6-inch; twenty 3-inch; twelve smaller guns.

JAPANESE BATTLESHIP "MIKASA," RECENTLY COMPLETED AT BARROW, ENGLAND.

Genoa Electric Incline.

A very successful electric incline has been recently installed at Genoa. It starts from the Piazza Principe and has a length, measured on the horizontal, of 3,520 feet and the difference of level is 617 feet, giving a mean grade of 17 per cent. The line is single track with the exception of a crossing in the center. The rack-and-pinion system is used, the rack being in the middle of the track. The ties are supported on a strong masonry bed to prevent slipping. The cars are self-propelling and are arranged so that the platforms are horizontal when on the incline. The wheels are loose on the main axles and each axle carries in the center the large gear wheel which engages with the rack. This gear is operated by a direct current motor of 30 horse power working at 500 volts, which drives it by a set of reduction gearing. Each motor has a resistance-box on the roof and a rheostat under the car floor. The trolley system is used, with an overhead wire supported on pole-brackets. The car descends by its own weight and in this case the motor acts as a brake by becoming a generator. The controller, by varying the resistance, controls the descent at will. A special brake system is also provided for the descent and each car has two hand-brakes, in one of which a shoe is applied against a wheel placed on each axle, thus braking the gear-wheel of the rack, while the second is a band-brake upon a pulley placed on the armature shaft of each motor. The cars have a central compartment and two closed platforms and contain 30 persons in all. At each end is a small cabin, one for the motorman in front and the brakeman in the rear. In running, two cars are used, which start from each end and cross in the middle. The trip requires 14 minutes, with an average speed of 5.5 miles an hour and a maximum of 8. If need be the brakes can bring the car to a full stop, at the latter speed, within a distance of 3 feet. The electric outfit has been furnished by a Swiss company, the Compagnie de l'Industrie Electrique of Genoa.

Charles T. Schoen, of pressed steel car fame, announces that the pressed steel car wheel has demonstrated its utility by a severe test in actual service, and the new plant projected for the manufacture of the wheels will have an initial capacity of five hundred wheels per day.

Foreign Uses of Oil Fuel.

Early in February Consul Phillips, of Cardiff, received a letter from Galveston propounding certain queries as to the likelihood of oil fuel being introduced there. He replied as fully as he could at the time; but he has since made further investigations and now furnishes the results.

The consul ventures to prognosticate that this new combustible is destined ere long to revolutionize the coal markets of the world. The abnormal cost of steam coal in Great Britain—particularly in Wales—and the exorbitant price of the best house coal (£1 6s., or $6.50 per ton) are calculated to hasten this revolution.

An impetus was given to this industry five years ago, when petroleum discovered in Borneo was found to be well adapted for fuel purposes. This field is owned by the Shell Transport and Trading Company, Limited. Last year (1901) the exports exceeded 100,000 tons.

The Dutch Steamship Company uses this fuel in its boats; the Hamburg-American Line has built four new steamers adapte for oil fuel, and run them in t Eastern trade with marked s cess; the North German Llo has two local steamers usi oil; the East Asiatic Company of Copenhagen, employs thi fuel in its local boats, and is building two ocean-going steamers with the intention of using it; and the China Mutual is preparing three boats for the employment of oil.

The prejudice against oil fuel is passing away. Several firms are contemplating a change in their method of steam production, which they predict will be as safe as the old method and more economical. The advantages are said to be:

First. The saving of labor is large; there will be no ashes to hoist overboard after each watch; no need of stoking. All that will be necessary will be to watch the water in the boilers; the feeding of the fuel to the furnaces will be automatic.

Second. Fewer deck hands will be needed, as the dirt caused by coal shoveling will be done away with.

Third. Under proper combustion no smoke will be generated; every atom of oil is of calorific value; there is no residue.

Fourth. The fuel may be stored in the double bottom of a ship, the forepeak, afterpeak, and tanks under the engine room, thus occupying space not utilizable in any other way. No rust is possible where it is stored. The space now filled by coal bunkers is thus available for cargo; oil stores in a space of 35 feet per ton, as against 44 feet per ton of coal. The last results obtained show that Messrs. Thornycroft have evaporated 18.95 pounds of water per pound of oil in their torpedo-boat type of boiler, but in ordinary locomotive types 15 pounds of water per pound of oil is obtained.

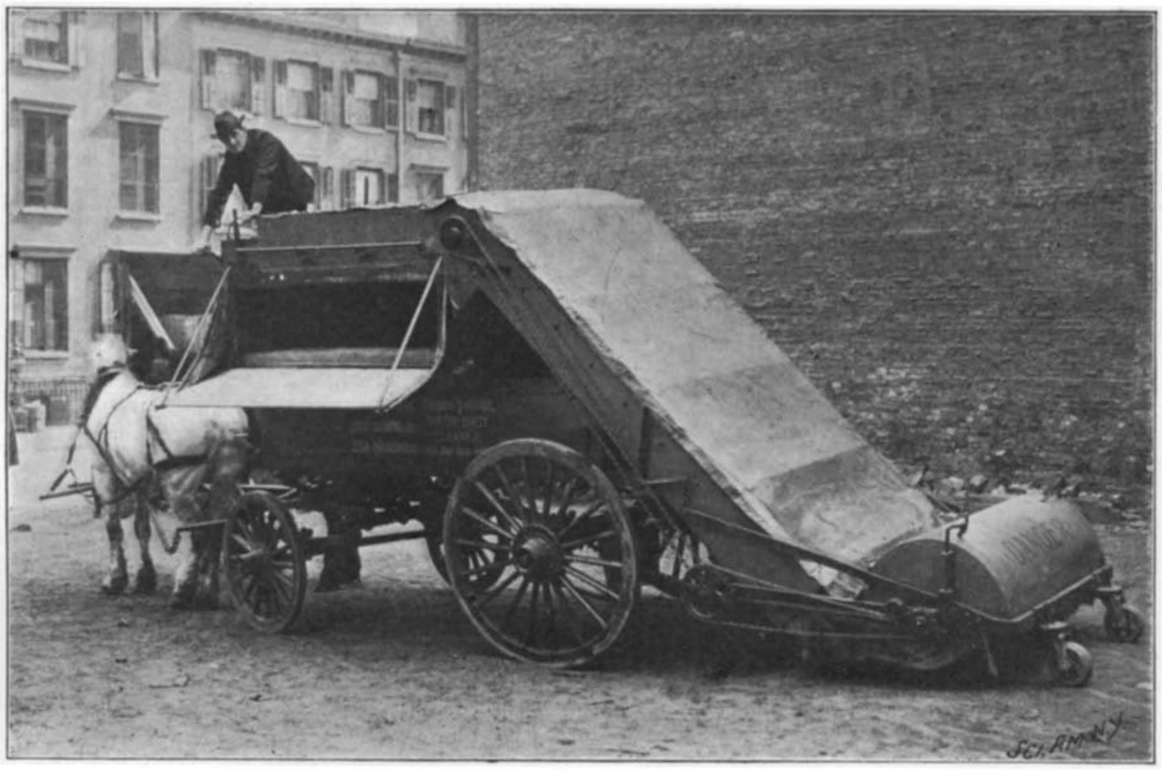
Fifth. The oil fuel has a higher concentration of heat for manufacturing than can be obtained with coal.

Until recently oil fuel was held at a figure which did not enable it to compete with coal. A few months ago, however, oil in tremendous quantities was discovered in Texas, and the Shell Company found that it was capable of giving the same results as are derived from Borneo oil. An enormous expansion of its use may be expected.

The Great Eastern Railway, in this country, has already a large number of locomotives using this fuel. They say that by its use steam is more easily produced and is maintained up the steepest gradients, and great economy is effected by reducing the supply of oil when descending or remaining stationary; the life of the boilers is prolonged, inasmuch as the tubes do not foul; the nuisance of smoke and the danger of sparks to surrounding property are entirely obviated, and the rolling stock generally is kept in a state of cleanliness which is impossible on a line where coal is used as a motive power.

NEW SYSTEM OF STREET CLEANING.

Some of our readers, passing up Fifth Avenue recently, may have noticed the new street-cleaning device used on that thoroughfare. A clear understanding of the machine can be quickly had by a glance at the diagrammatic view shown herewith. The rotary sweeper, *A*, at the rear of the machine is operated by chains and sprockets from the hubs of the rear wheels, and serves to gather up and throw the dirt onto a slide, *B*. Moving over this platform is an endless belt, *C*, on which are a series of scrapers that carry the rubbish upward and forward until from the top of the slide it drops into the dust-proof box, *D*. In order to prevent the rubbish from accumulating at the rear end of this box and choking up the mouth of the elevator a conveyor, *E*, is provided, which moves the dirt toward the front of the box as soon as it has piled up within reach of the paddles on this belt. Both the elevator and the conveyor belts are driven by chain gearing from the rear wheels. A large water tank, *F*, is situated below the rubbish box and, under control of the driver, feeds the sprinkler, *G*, placed directly in front of the sweeper.



A SANITARY STREET-CLEANER.

The advantages of this machine are evident. It does its work thoroughly and quickly without raising any dust; for the matter is first sprinkled and then raised through a covered elevator to a dust-proof receptacle. The whole operation is therefore under cover—a point which cannot be too strongly emphasized in any work which stirs up the heterogeneous filth of a city street. The machine holds two cubic yards of dirt, and the whole process of sprinkling, gathering and dumping can be controlled by a single man. The method of dumping the dirt is an interesting one. Referring again to the diagram we notice that the bottom of the rubbish-box is an endless sheet of iron which passes around rollers, *H*, placed along each side of the machine. These rollers are rotated by operating a lever at the driver's seat. Our engraving shows the door of the rubbish-box let down to form a chute for the dirt, and the driver may be seen operating the dumping lever. By rotating the pulleys the floor is fed forward, forcing the rubbish out onto the chute, whence it slides into a dump-cart or any receptacle placed thereunder.

This machine should work a revolution in the present antiquated methods of street cleaning. The slow, cumbersome operation of sweeping cobblestones by hand, aside from being expensive, is at the same time most unsanitary; for the rubbish is continually being stirred up

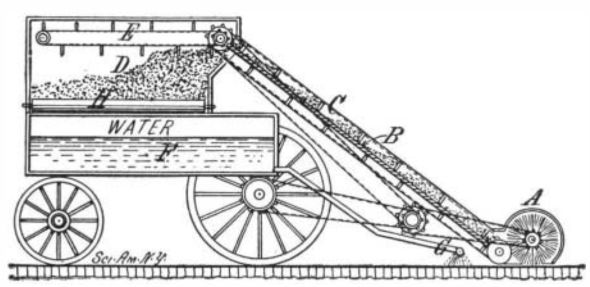


DIAGRAM OF THE STREET-CLEANER.

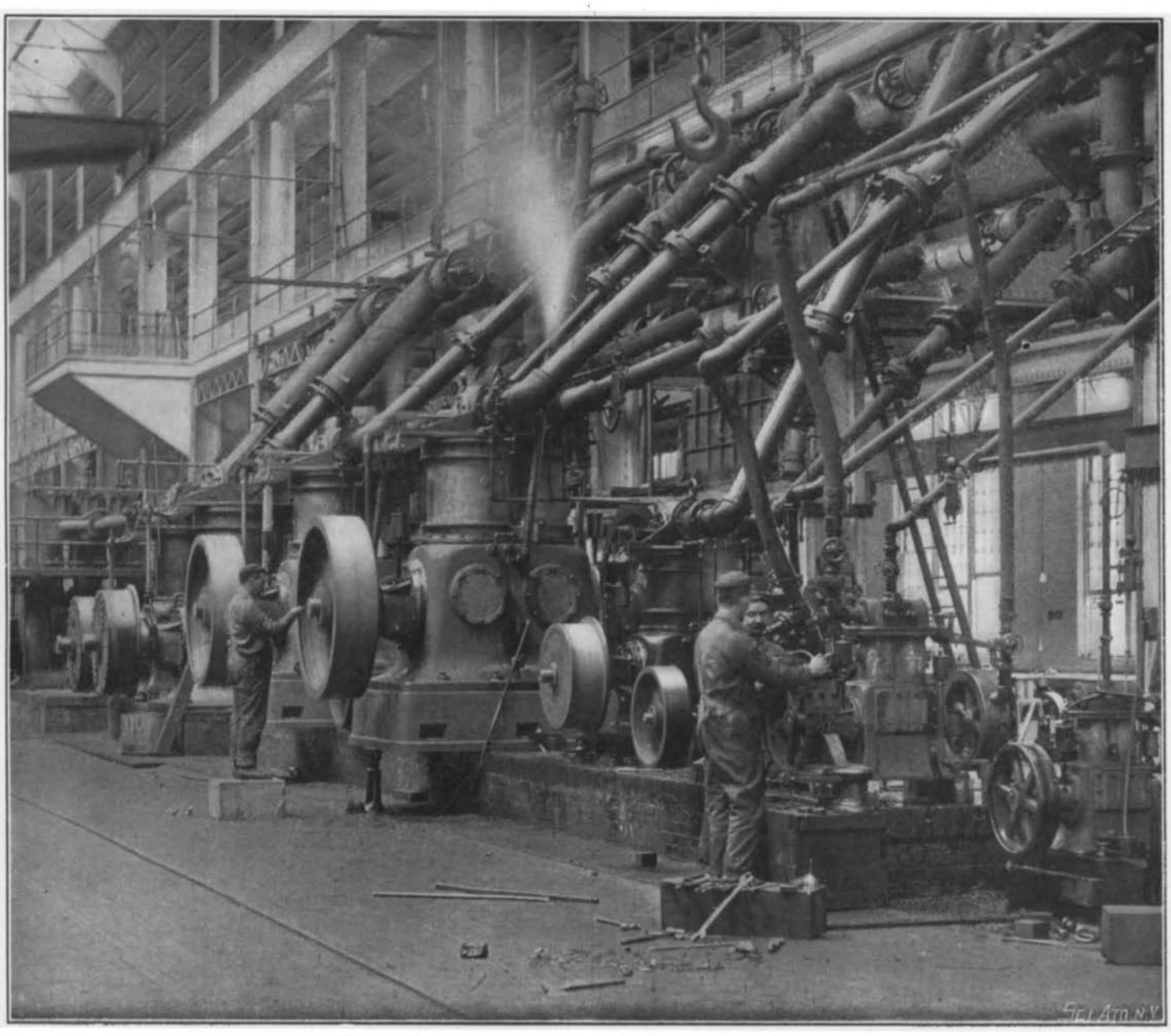
and laid open to the air, giving off bad odors. This machine, however, seems to fill all requirements; it sweeps on an average seventy thousand square yards of street per day at half the cost of hand labor and does the work without spreading any dust, odor or disease.

THE TESTING OF HIGH-SPEED ENGINES.

The testing room of the Westinghouse Machine Company's works is one of the most important and interesting features of the establishment. Extending down one side of the room is a long foundation bed, capped with plates which are slotted for holding-down bolts, which is capable of accommodating at one time as many as a dozen engines of sizes varying from 5 to 500 horse power. Above the testing bed, and at sufficient height to accommodate the larger engines, is a main steam pipe to which is connected a series of adjustable pipes, with swinging and extension joints. Behind the foundations are three surface condensers varying from 300 to 1,000 horse power capacity, while beneath each condenser, and mounted on platform scales, are two weighing tanks with suitable connections for delivering the water to one or the other, as desired. Each condenser is supplied with a vacuum pump, to enable the test to be made with the engine exhausting into a vacuum should a test of this nature be called for.

Every engine that is made in the Westinghouse shops is ultimately sent to the testing department, where it is set up and connected to steam and exhaust. A friction brake is put on the crankshaft and the engine is given a service test of from 20 to 60 hours, the duration depending upon the size of the engine. The object of this test is to regulate the governor and to develop any latent defects which might have escaped inspection at the erecting shops. When the run is ended the indicator is applied and the exhaust is turned into one of the surface condensers, the brake load and the steam pressure being maintained at a constant figure. This test is known as the duty test, its object being to determine steam consumption at rated load, and also at half and quarter load. During the test, indicator diagrams are taken, and the water coming from the condenser is weighed at frequent intervals and the results computed and entered on a record blank.

The system of testing is carried out with a view to determining both the steam consumption per indicated horse power and also the steam consumption per net or delivered horse power, the latter being the indicated horse power less the friction losses in the engine itself, and, therefore, the power actually available on the crankshaft. The tests as thus carried out are in no sense "laboratory tests." The conditions, moreover, are not



SECTION OF THE WESTINGHOUSE HIGH-SPEED ENGINE TESTING FLOOR.